

1983

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Citation of this paper:

Laidler, David. "The "Buffer Stock" Notion in Monetary Economics." Department of Economics Research Reports, 8313. London, ON: Department of Economics, University of Western Ontario (1983).

11435

ISSN: 0138-725X
ISBN: 0-7714-0429-8

RESEARCH REPORT 8313
THE "BUFFER STOCK" NOTION IN
MONETARY ECONOMICS*

by

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May 1983

*The 1983 Harry Johnson Lecture presented on April 12, 1983, at Oxford University to the Joint Annual Conference of the Royal Economics Society and the Association of University Teachers of Economics.

I am grateful to Bob Clower, Peter Howitt, Patrick Minford, Bob Nobay, David Peel and Baldev Raj for comments which have helped me in revising this paper, but exonerate them of contributing to any of the errors it may still contain.

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I. INTRODUCTION

Not the least of Harry Johnson's contributions to our discipline was the series of survey papers on aspects of monetary economics which he produced during the 1960s and 1970s. It is no exaggeration to say that the way in which the literature of monetary economics is organised even now follows the design which Johnson first set out in (1962) and built on in the subsequent decade. Nevertheless, the subject has not stood still, and one of the more interesting developments of the last few years has involved the introduction of what has been variously described as the "disequilibrium money", "shock absorber" or, as I prefer to call it, the "buffer stock" notion into monetary economics.

The development of this line of thought was getting underway before Johnson's untimely death, much of it indeed under the auspices of his own research programme at the LSE. Even so this did not happen early enough for the relevant ideas to be put in their proper niche by Johnson himself, and the buffer stock approach is not yet fully integrated into the mainstream of monetary economics. Much of the relevant literature is empirical, concerned with modelling particular aspects of the monetary experience of specific countries: hence it is fragmented, and contains few papers which attempt a coherent account of just what this approach is and how it relates to other approaches to monetary analysis. Although essays by Goodhart (1982 a and b), and Judd and Scadding (1982a) contain important discussions of these issues, to the best of my knowledge only Jonson (1976a) and Knoester (1979a) have devoted entire papers solely to this central issue, and these are relatively inaccessible and hence less widely known than they deserve to be.

In this lecture, I shall attempt to give a brief account of the essentials of this approach. First I shall sketch out its microeconomic background, and then I shall discuss those theoretical characteristics which differentiate it from the "neo-Austrian" analysis of Robert E. Lucas Jr. and his associates, as well as from the conventional "Keynesian" approach to monetary economics. Last, but by no means least, I shall argue that it yields simple theoretical insights into important empirical and policy-related issues which are troublesome for alternative approaches. In short, my tribute to Harry Johnson on this occasion involves me in the dangerous business of trying to emulate him, by offering a survey of a new and interesting body of analysis. I hope that my failure to match his standards of clarity and incisiveness in this lecture will not deter those who hear or read it from taking the subject matter seriously.

II. THE MICROECONOMIC BACKGROUND

Exponents of the notion of money as a 'buffer stock', and of the body of macroeconomic analysis associated with it, imagine the typical economic agent to operate in what is commonly called a 'market economy', but markets in the everyday sense of the word are conspicuous, if not by their absence, then at least by their rarity in such an economy. Trade does not take place at one time and place, and at prices known to all agents; nor does it consist of a series of bilateral exchanges of goods and services between agents, each of whom is intent on consuming what he receives in each transaction. Instead, trade is multilateral with one party to each bilateral exchange typically accepting some asset, not because he desires it for its own sake, but because he confidently expects someone else to accept it from him in due course in

exchange for something else.

The buffer stock approach thus presupposes the existence of a system of monetary exchange. Such a system, considered as a social institution, is a substitute for the kind of Walrasian market which, more often implicitly than explicitly, provides the basis of so much macroeconomic theory.¹ Though barter transactions occasionally take place, and although trade credit arrangements also exist, the typical would-be buyer, whether a firm seeking labour, or a household seeking consumption goods, must as a matter of social convention offer in exchange money, or a credible promise to deliver money in the near future, in order to be able to transact. Moreover, given that there are costs to finding a buyer for assets when money is required, the individual agent might be expected to hold a fraction of his wealth in money as a "temporary abode of purchasing power", to use Milton Friedman's phrase, even if it yields a lower explicit return to him than do other stores of value.

Theorising about the demand for money typically takes arguments such as these for granted, and answers questions about what determines how much money the individual agent will want to hold, and about how that quantity varies with its determinants. The relevant 'quantity of money demanded' here is not an entirely straightforward concept. The phrase does not refer to an amount of money which an agent will want to hold at each and every moment, but rather to an amount which he will want to hold on average over some time interval. The phrase 'quantity of money demanded' denotes, that is to say, the average or target value of an inventory, of a buffer stock, of cash balances.

The foregoing proposition is true even about the demand for money of an agent who is always able to fulfill his plans, and for whom trading

activities bring no surprises; but it is also true about the demand of one whose income is subject to unforeseen variations, or whose expenditure is on goods the availability of which cannot be taken for granted, or the prices of which fluctuate unexpectedly.² To hold a buffer stock of generally acceptable purchasing power prevents, at least in part, surprises in markets where the agent is a seller from impinging upon his buying activities, and vice versa. Indeed the matter goes deeper: an agent's chances of being surprised in his market activity are not independent of the time and effort he puts into seeking and processing information relevant to those activities. If money holding enables him to endure the consequences of surprises at lower cost than would otherwise be the case, the very existence of a monetary system which enables him so to protect himself will cause him to be more prone to surprises. Hence fluctuations in holdings of money about their target value are of the very essence of economic activity co-ordinated by monetary exchange.³

The individual agent's target demand for money might itself be expected to vary over time. The conceptual experiments which we perform at the level of the individual agent when teaching the theory of the demand for money usually involve the postulate that he is faced with some exogenous shift in one or more of the determinants of his demand for money--an interest rate, the price level, or his level of permanent income, say. We then trace out the consequences of that change for the agent's target holdings of nominal balances. Sometimes we complicate our experiment with an account of the effects of rising marginal adjustment costs on the path which money balances follow over time as they are brought towards that target level. When we do this, we refer to the target level as the 'long-run' demand for money, and to

intermediate steps along the adjustment path as points on various, essentially Marshallian, short-run demand for money functions.

The experiments to which I have just referred are typical of the literature, but, in an economy characterised by monetary exchange, the windfall gains and losses which the agent experiences from time to time might well manifest themselves in unexpected variations in his cash holdings. A discrepancy between actual and long-run target money holdings can just as well arise from this source as from changes in the arguments of the agent's long-run demand for money function, and there is no reason to believe that the way in which he responds to such a discrepancy depends in any way upon what generates it. Given that a discrepancy exists, the agent will attempt to move towards his long-run target demand for money by altering his current rate of flow of expenditures on goods, services, and asset accumulation. That is to say, for the individual agent, a discrepancy between actual and desired cash balances will set in motion a real balance effect.⁴

I make no claim for any novelty in the microeconomic aspects of the buffer stock approach to monetary analysis which I have just described. Apart from a few nuances of emphasis, mainly having to do with trade being a matter of monetary exchange rather than simultaneous barter, and with the characterisation of the agent's long-run quantity of money demanded as being a target or average-over-time value of an inventory, rather than a fixed amount observable at any moment, there is nothing in the last few paragraphs which is not a commonplace. Nevertheless, these apparently unimportant nuances, which so much of the literature of monetary economics ignores, form the basis of the buffer stock approach.

III. THE MARKET EXPERIMENT, EQUILIBRIUM, AND DISEQUILIBRIUM

We are not concerned with the individual agent for his own sake in monetary economics. We are interested in macroeconomic phenomena, with the way in which changes in the money stock interact with the real side of the economy to influence income, employment and the price level, not to mention the balance of payments and the exchange rate in open economies.⁵ The notion of an aggregate demand for money function is central to the analysis of these issues, and we study the individual agent mainly to get some insight into the nature of this aggregate relationship. Typically, indeed, that is all we do; and the aggregate function is often treated as being simply a scaled-up version of the demand function of some representative agent.

It is hard to deny that such a simple approach to studying money in the aggregate economy has been fruitful, but nevertheless, when we follow it, we downplay the very properties of money stressed in the foregoing discussion of the individual agent. In particular we treat the aggregate demand for money as determining a quantity of cash balances which the economy as a whole will wish to hold, not just on average over time, but at any moment; and we also assume that market mechanisms somehow operate to ensure that the demand for money thus determined is kept equal to the quantity of money in circulation. There is no other way to justify the almost universal use of the quantity of money in circulation as the dependent variable in empirical studies of the demand for money function, regardless of the period of observation to which the data appertain.

The procedures to which I have just referred may or may not be safe, but to criticise them effectively we must show that the factors which they ignore are important for the real world phenomena about which monetary economics makes predictions. The buffer stock approach claims that, in treating money 'as if' the economy had a well determined stock demand for it which is realised at each and every moment, conventional treatments of monetary analysis do indeed leave out of account factors whose absence detracts from their empirical content.

The above criticism is levelled at both conventional 'Keynesian' macroeconomics and at the 'neo-Austrian' analysis of Robert E. Lucas Jr. and his associates. These two bodies of macroeconomics are very different from one another, and the latter has much less in common with the buffer stock approach than does the former, as we shall see in due course. Nevertheless, both proceed 'as if' the observed demand and supply for money were always equal to one another. In the Keynesian approach it is interest rate flexibility which guarantees this, and in the neo-Austrian framework, general wage and price flexibility. In each case, however, the economy is treated as being always 'on' its aggregate demand for money function. It is this property of both types of model which the buffer stock approach challenges; that is why it is sometimes referred to, somewhat misleadingly, as the 'disequilibrium money' approach.

The notions of 'equilibrium' and 'disequilibrium' which are creeping into the discussion, had better be clarified. By 'full equilibrium' I mean a situation in which each agent is able to carry out all his plans vis-à-vis buying and selling goods, services, and assets, and in which the ex ante

expectations upon which those plans are based are fulfilled ex post. The buffer stock approach is not differentiated from others merely by the suggestion that the world we live in occasionally might depart from such a full equilibrium state. Indeed that branch of neo-Austrian analysis called 'equilibrium business cycle theory' relies for most of its content on a careful analysis of the consequences of the last mentioned condition being systematically violated across agents. The models which that theory generates are nevertheless 'equilibrium' models, in the more limited sense that all agents' ex ante plans are executed in markets where prices are free to vary in order to reconcile any initial inconsistencies among those plans before trading takes place.

Such equilibrium models are constructed so that all agents in them can and do at each and every moment achieve, among other goals, their target levels of money holdings. Once one begins to think of money explicitly as a buffer stock, it becomes a distinct possibility that such a notion of equilibrium might be too restrictive. It is of the very essence of such a stock that the agent should expect, and even perhaps plan, to be away from his desired average holdings of it from time to time; but when he is, it might reasonably be argued that he is hardly 'out of equilibrium' in the sense of being unable to carry out his plans. Furthermore, an equilibrium business cycle theorist would be unlikely to attach much significance to this point. An economy in which the supply and demand for money were equal to one another in the aggregate would behave in the same way, regardless of the state of individual money holdings, unless there were systematic distributional effects at work, and it is customary not to rely on such effects in macroeconomics.⁶

Thus the equilibrium business cycle theorist could argue that the buffer stock idea was only significant for individual behaviour at best, and irrelevant for understanding events at the level of the economy as a whole.

The buffer stock approach does not in any a priori way imply either the theoretical or empirical irrelevance of the idea of an equilibrium between the aggregate demand and supply of money. However it does stress the possibility that, at certain times and places, and over certain time intervals, because time aggregation too could eliminate them, discrepancies between the actual and desired money holdings of individuals might not cancel out upon aggregation over agents.⁷ More specifically, it asserts that the kind of quarterly and even annual macroeconomic data which we use in our empirical work are sometimes usefully analysed in such "disequilibrium" terms and that therefore, the above-mentioned defence of equilibrium methods of analysing such data is suspect. For this to be the case it is necessary that wages and prices be less than perfectly flexible, but this postulate is not sufficient to guarantee the relevance of the buffer stock approach. I shall now take up these points in more detail.

IV. PRICE STICKINESS AND THE ROLE OF THE RATE OF INTEREST

The difference between the buffer stock approach and neo-Austrian equilibrium economics concerns the interpretation of a simple stability experiment of the following kind. Suppose a closed economy is initially in full equilibrium, in the sense defined above, and suppose, for the sake of simplicity, that money in this economy is non-interest bearing fiat currency. Then let its nominal quantity be unexpectedly increased by a certain amount. At the instant immediately after this increase, but before

any response to it, a state of disequilibrium characterised by an excess supply of money and an (on average) excess demand for everything else would obtain.

The equilibrium theorist and the buffer stock exponent would agree upon what must happen to remove this disequilibrium: prices must rise as must output, and interest rates must fall, in some combination.⁸ For the equilibrium theorist, however, the requisite changes would take place in meta time; for him the very fact that it can be shown that the new quantity of money is incompatible with existing prices and quantities is sufficient reason to conclude that they cannot co-exist. For the buffer stock advocate, the incompatibility in question is removed over actual time as the streams of expenditure which it sets in motion influence first interest rates and output, and then prices. For the neo-Austrian, the real balance effect which lies at the heart of our stability experiment guarantees that a discrepancy between the supply and demand for money will not persist for any interesting time interval; for the buffer stock advocate, the same effect is made manifest in the movement over time of the macro variables in which he and every other macroeconomist is interested.

Though the buffer stock approach is vulnerable to the usual charges of ad hocness in its reliance on unexplained wage-price stickiness, it does suggest a possible line of defence against this charge. If individual agents find it costly to vary money wages and prices, and to gather the information upon which to base such changes, then the availability of a buffer stock of money which softens for them the consequences of making errors about these matters might itself be a source of wage and price stickiness. This argument would surely repay more careful attention than I have space to give it here.

Be that as it may, the buffer stock approach differs from orthodox "Keynesian" theory too, even though the latter also relies upon price stickiness. For the Keynesian, interest rate flexibility suffices to keep the supply and demand for money in equilibrium.⁹ In his view, an increase in the supply of money such as we have just postulated will immediately drive down the rate of interest until the supply and demand for money are equal. As a consequence, the present value of the streams of returns expected to be produced by existing capital goods rises above the current supply price of newly produced capital goods. The flow demand for capital goods therefore increases, as does their output. Increased demand spreads throughout goods markets as a result of incipient multiplier effects, and prices begin to rise. In turn, interest rates begin to increase too, and ultimately, if there are no more disturbances, the economy moves to a full equilibrium not too different from the eventual outcome of the neo-Austrian version of this experiment. It does so, however, by way of a process during which the supply and demand for many items, but not for money, are either unequal or are kept in equality by quantity rather than price fluctuations.¹⁰

Because the buffer stock approach relies on price stickiness as much as does orthodox Keynesian analysis, its account of the later stages of the transmission mechanism is essentially the same as the one just sketched out. Indeed the only, but far from trivial, difference between the two approaches concerns whether the initial impact on the rate of interest of an increase in the money supply is sufficient to bring the supply and demand for money into equilibrium immediately. In the Keynesian model it is, and in the buffer stock approach it is not. This is a small enough difference, but it is an important difference for explaining empirical evidence. It is also

a difference of some theoretical interest for it turns out to be a manifestation of the distinction between "liquidity preference" and "loanable funds" approaches to the analysis of the rate of interest, as I shall now argue.

It is usual to defend the postulate of price stickiness by noting that Walrasian markets do not in fact exist in the real world, so that it takes time for new information to be digested and acted upon by the endogenous agents who in fact set the prices at which trade takes place. Nevertheless it is also usual to argue that, in markets dominated by specialist traders whose major role is to gather information and translate it into price changes, prices do in fact behave very much as they would if they were determined by a continuous auction, in which supply and demand were always held equal. Prominent among these Hicksian 'flex price' markets are those for financial assets such as bonds. However, even granted that the rate of interest is a 'flex price', and granted that a sufficiently large change in it could keep the supply and demand for money in equilibrium, it does not follow that those who set the rate of interest will in fact cause it to change by a sufficient amount to accomplish this in the face of a change in the supply of money: those who set the rate of interest are proximately concerned with the supply and demand for bonds, and not money.

To put it in the traditional language which I have already used, the theory of the interest rate which underlies the buffer stock approach is a loanable funds theory and not a liquidity preference theory. Now of course, in an economy in full equilibrium, the interest rate, not to mention all other prices, takes a value at which savings and investment and the supply and demand for money are simultaneously equal. However, the notion of money

as a buffer stock is at its most relevant when the economy is not in equilibrium, and there is no reason to suppose, as Harry Johnson (1951-2) long ago pointed out, that liquidity preference and loanable fund theories of interest are equivalent in such circumstances.¹¹ It is only in equilibrium models that questions about which prices convey what information and incentives to whom are irrelevant. Leijonhufvud (e.g. 1981) in particular has continually reminded us that they are of the very essence when dealing with the social process whereby information is transmitted and individual activities co-ordinated in the presence of frictions which prevent a state of general equilibrium continuously obtaining.

Consider, in the light of these factors, the effects on the interest rate of an increase in the quantity of money. The buffer stock approach has it that the efforts of agents to rid themselves of excess money holdings lead, among other effects, to a stepped-up flow demand for bonds in the economy. This in turn puts downward pressure on the rate of interest as bond dealers attempt to prevent their inventories of bonds being exhausted. Such a lower interest rate might make agents in general more willing to hold money, and might even induce bond dealers to increase their own inventories of money at the expense of bonds as a speculative measure. However, the proximate cause of this lower interest rate is an increase in the flow demand for bonds induced by an excess stock supply of money. It is hard to see how it could be sustained if it were large enough immediately to eliminate the very excess stock supply of money which had induced it in the first place.¹²

The matter at issue here is even more clearcut in the limiting theoretical case in which the demand for money is independent of the rate of interest. Here

the supply and demand for money can only be equilibrated by an increase in real income or prices. If it is granted that these variables change sluggishly, then after a change in the money supply there must persist a discrepancy between the supply and demand for money while the economy moves to a new full equilibrium; by assumption, no fall in the rate of interest can eliminate that discrepancy. In the "vertical LM curve" case, then, the buffer stock approach has much a priori appeal.

So long as money constitutes, on the margin, net wealth to the economy, few would deny that, in the presence of price stickiness, real balance effects will have a direct and observable influence on expenditure on goods and services. In such circumstances it is not hard to argue that the case for the buffer stock approach has a certain plausibility. However, where money is an "inside" asset and is not net wealth, the real balance effect is reduced to a matter of asset substitution working solely through the rate of interest. If we set aside the possibility of agents substituting directly from money into such real assets as consumer durables, the case in which monetary policy works solely through interest rates is one in which the capacity, or lack thereof, of the rate of interest to equilibrate the supply and demand for money becomes crucial to judging the relevance of the buffer-stock approach. If the interest rate can instantaneously equilibrate the supply and demand for money in such a case, then at the very least, the approach in question loses generality.

When Gurley and Shaw (1960) coined the term 'inside money', they applied it to the monetary liabilities of a privately owned banking system; they also argued that experiments of the kind I have been discussing, having to do with variations in the quantity of "outside" fiat money, were virtually

irrelevant for understanding the workings of any modern economy in which money is overwhelmingly bank money. Anyone who accepts this view, and who also regards the limiting "vertical LM curve" case as more of an analytic curiosity than a serious empirical possibility, will regard the arguments which I have so far developed for the buffer stock approach as being rather tenuous. He would be wrong to do so. The extended and tortuous debate which followed the publication of Pesek and Savings' (1967) Money Wealth and Economic Theory established that Gurley and Shaw's version of the inside-outside distinction was quite misleading.

The debate in question established instead that the appropriate distinction is between interest bearing and non-interest bearing money: specifically, regardless of whose liability it is, any money which bears interest at a market rate is not net wealth on the margin, and any money which does not bear such interest is net wealth.¹³ Thus it is changes in the quantity of competitive interest bearing money whose influence is transmitted purely by interest rate changes; but obviously an economy which uses such money is characterised by something approximating a vertical LM curve. The very economy in which the real balance effect is reduced to a matter of asset substitution is therefore one in which changes in the rate of interest alone are unlikely to be able to eliminate a discrepancy between the supply and demand for money. On the other hand, the economy in which the demand for money is responsive to market interest rates, so that interest rate changes might conceivably eliminate such a discrepancy, is an economy in which money is net wealth on the margin and in which real balance effects fall directly on goods markets. In such an economy the role of the interest rate in the monetary transmission mechanism is less

crucial to establishing the a priori plausibility of the case for the buffer stock approach.¹⁴

The reader may or may not find the above arguments convincing, but even if he is willing to entertain the idea that the interest rate changes which come in the wake of a change in the money supply are not sufficient to equilibrate the supply and demand for money, he might still be inclined to downplay the significance of the point. Certainly, it differentiates the buffer stock approach from conventional Keynesian ideas in a somewhat less fundamental way than the notion of price stickiness distinguishes these two bodies of theory from neo-Austrian analysis. Nevertheless, this theoretical difference is of considerable practical importance, because it leads to very different empirical predictions and to very different perceptions about what monetary policy can and cannot accomplish. That is to say, the case for the buffer stock approach ultimately rests as much upon its empirical content as upon a priori reasoning.

V. EMPIRICAL QUESTIONS

The key empirical difference between the conventional Keynesian and the buffer stock approaches has to do with the existence, or otherwise, of a "short-run" aggregate demand for money function. At the level of the individual agent, there is no problem. If some argument or other in the function determining the agent's long-run "target" level of money holding changes, one needs only to suggest that he encounters increasing marginal costs in adjusting his cash balances in order to derive for him a Marshallian

"short-run" demand function, or rather an array of such functions, each one defined with respect to a different period of time elapsing after the initial disturbance. However one cannot treat the economy as a whole "as if" it were just like one representative agent with regard to such an experiment: the individual agent can always change his nominal money holdings by making market transactions, but the economy as a whole cannot usually do so.¹⁵

Suppose once more that the nominal stock of fiat money in an economy was exogenously increased. In that case, there would emerge initially excess money holdings for the typical agent and for the economy as a whole. The buffer stock approach tells us that such an excess of money leads to positive real balance effects in all markets. The typical agent undertakes expenditure flows designed to take him along a path towards a new long-run target level of real balances. Interest rates are pushed down, and output increases, but though the gap between them is narrowed, there still persists at this first stage in the transmission mechanism a discrepancy between the amount of money which agents in the economy wish to hold in the long run and the amount in circulation.

Suppose, however, that markets work as the Keynesian postulates, so that the rate of interest continues to fall so long as agents try to reduce their money holdings at any positive rate.¹⁶ In this case, the rate of interest must move instantaneously to a value at which the long-run and not the short-run quantity of money demanded absorbs existing cash. This must happen because the costs which agents face in adjusting their cash holdings, and which underpin the short-run/long-run distinction at the level of the individual experiment, are never in fact encountered. When any

incipient flow of cash into the bond market causes the rate of interest to move downwards, this latter movement is exogenous to the individual agent. Hence it does nothing to eliminate his incipient flow of expenditure on bonds. The latter continues until its source has been eliminated, and the source in question is the difference between his actual and long run desired money holdings.

With interest rate flexibility, then, the long-run/short-run distinction is empirically irrelevant, and a lagged dependent variable in the aggregate demand for money function is hard to justify; but as everyone knows, this variable is, as a matter of fact, much utilized and apparently badly needed.¹⁷ Cycle phase average data, such as used by Friedman and Schwartz (1982), and data drawn from time periods long enough to be dominated by secular variations, have been used to estimate demand for money functions without resort to lagged dependent variables. However, with quarterly data, and even annual data drawn from rather short time periods--fifteen to twenty years say--it is usual to invoke adjustment costs and the Marshallian long-run/short-run distinction so as to achieve satisfactory econometric results. In recent years, though, such satisfactory results have proved harder and harder to obtain even with the use of such an expedient: hence the growing concern among economists and policy makers alike about instability in the demand for money function.

The buffer stock approach claims to be able to account for the presence of a lagged dependent variable in empirical demand for money functions, and also yields suggestions about the causes of recently observed instability in the relationship. As I have shown elsewhere (Laidler 1982, Ch. 2) a demand for money function with a lagged dependent variable may be interpreted as a particular way of writing down the relationship between changes in the

money supply and subsequent changes in prices, in which the entire transmission mechanism is approximated by a single "black box" parameter which is equal to unity minus the coefficient of the lagged dependent variable. The fact that such an expression can be derived from the buffer stock notion shows that this approach can, in principle at least, account for the empirical success of so-called short-run demand for money functions.

At the same time we have here an obvious starting point for an explanation of why such short-run demand functions have been less successful in recent years. It is well known that the transmission mechanism of monetary policy is complex and subject to long and variable time lags, and yet in the case of single equation "demand for money" studies, the buffer stock approach implies that the mechanism is embedded in one constant parameter. Would it be surprising if such a procedure proved satisfactory enough when dealing with periods of monetary tranquility, but turned out to be inadequate when faced with the unstable money supply behaviour of periods like the 1970s? If this conjecture is true, it might imply that the apparent fragility of the demand for money function in recent years stems not from problems with that relationship, but is rather a statistical artifact generated by inadequate modelling of the transmission mechanism.¹⁸

Providing a possible solution to the puzzle of instability of the demand for money function is not the only way in which the buffer stock approach tends to re-instate the importance of money for the behaviour of contemporary economies. It is often suggested that developments in financial markets have lately rendered money less interest elastic in demand than it once was, and hence less controllable by the authorities. In the limiting, zero elasticity, case, so it is argued, the authorities cannot change

the quantity of money at all by way of open market operations: if changes in the price of bonds have no effect upon the public's demand for money, how can such changes cause the quantity of money in circulation to vary? If one takes the view that the economy is 'on' its demand for money function at each and every moment, it is hard to resist this argument.¹⁹ However, the buffer stock approach enables one to counter it in terms of what amounts to a dynamization of Brunner and Meltzer's (e.g., 1976) analysis of the money supply process.

Brunner and Meltzer have long, and correctly, argued that, when the authorities raise the price which they offer for bonds, the public does not sell bonds to them because it wishes to hold more money. Rather the public sells bonds because it wishes to substitute higher yielding assets, such as physical capital, for them in its portfolio. The quantity of money in circulation is thereby increased, not because anyone wishes to hold extra cash, but because he must obtain it as an intermediate step to purchasing capital equipment, and because, if all agents in the economy are simultaneously trying to do this, the cash in question can only be obtained by selling bonds to the authorities. Thus money, which no one wishes to hold, is nevertheless created by open market operations. So long as the public's demand for bonds responds to interest rate changes, in Brunner and Meltzer's terms so long as there is a non-zero interest elasticity of demand for credit, open market operations can lead to the quantity of money in circulation changing, even though the demand for money is totally interest inelastic. This can only happen because the public's desire to substitute physical capital for bonds in its portfolio makes it willing, as an intermediate step, to accept money from the authorities over and above its long-run demand for that asset. It can only happen, that is to say, because money is a buffer stock.

VI. CONCLUDING COMMENTS

The conclusions to be drawn from this lecture are easy enough to summarize. It is natural to think of the money holdings of the individual agent fluctuating over time around their long-run desired level, but if prices in general are flexible, as the neo-Austrian postulates, then such fluctuations will not have any observable consequences at the level of the economy as a whole. Nor will they have such consequences if prices are not flexible, but if, as the Keynesian suggests, the interest rate always moves to keep the aggregate supply and demand for money in equilibrium.

The neo-Austrian postulate might be right as might the Keynesian; but, if either of them is, it is difficult: to understand why lagged dependent variables are required in empirical work on the aggregate demand for money function; to explain why such functions began to display instability in the 1970s; and to see how open market operations can be used to control the quantity of money in a world where so many assets which play the role of money bear interest at competitive rates. To these puzzles the buffer stock approach offers a simple solution based on the straightforward suggestion that fluctuations in money of holdings around their desired level characterise market experiments as well as individual experiments.

In addition to the qualitative aspects of the case for taking the buffer stock approach seriously, upon which I have concentrated in this lecture, there exists, as I noted at the very outset, a large and growing body of successful quantitative work based upon it. There is space here only to mention some representative studies. As far as the demand for money function per se is concerned, the issues which I have raised in this

paper have been investigated for the United States by, among others, Lewis (1978), Laidler (1980), Coats (1982) and Judd and Scadding (1982b), for the United Kingdom by Artis and Lewis (1976) and for Finland by Kanninen and Tarkka (1983). The buffer stock approach gets support from this work, particularly the more recent studies.

Single equation experiments such as I have just cited are not altogether adequate for investigating the buffer stock approach. It is, after all, a postulate about the transmission mechanism of monetary policy and this mechanism involves the whole economy, not just the demand for money function. In this context too, the approach has already generated a substantial body of literature. For the United Kingdom, one may point to the models of Jonson (1976b), Knight and Wymer (1975) and Coghlan (1981) not to mention the less formal analysis of Goodhart (1982b); for the Netherlands we have the work of Knoester (1979), and for Australia the RBA 76/78 models of Jonson and his associates (e.g. 1976, 1978). To cite the above work does not imply that all of it is in every respect unquestionably satisfactory. No doubt careful scrutiny of any of the above-mentioned studies would lead to important questions requiring further work to resolve them. Such a comment is always true, however, when new ideas are being developed and tested, and in any event, one can already see where further questions might in particular arise.

To begin with there is nothing unique in principle about discrepancies between the supply and demand for money when it comes to setting in motion streams of expenditure. Excess supplies of other financial assets too might be important because, as for example the analysis of Gray and Parkin (1973) shows, in a multi-asset world, money is simply the most liquid of assets held

as a buffer stock and is not otherwise unique in this respect. Furthermore, in addition to holding financial buffer stocks, economic agents also hold inventories of raw materials and finished goods. The interaction of the demand for inventories with the behaviour of stocks of financial assets is well worth investigating, both theoretically and empirically. The importance of inventory fluctuations over the course of the business cycle suggests that such interaction would have to play a central role in any "buffer stock" model of the cycle which was to prove a satisfactory alternative to the currently available neo-Austrian explanations of Lucas (1976), Sargent (1976), and Barro (1978).²⁰ Indeed, Howitt (1979) has argued that, in the presence of inventories, the distinction between models in which markets do or do not clear, is largely semantic. If that argument is accepted, the model whose future existence I am conjecturing here might turn out to be as much an extension of these explanations as an alternative to them.

In short, the theoretical basis of the buffer stock approach to monetary analysis is well developed and simple, and it has already withstood a good deal of empirical testing. In his last survey paper on monetary economics, presented just ten years ago to a Conference of the Money Study Group held at this university, Harry Johnson urged us to develop ideas which are "...scientifically robust and sufficiently simple to be communicable to... students and policy makers and the general public." (1974). The buffer stock approach already has these characteristics, and as I claimed at the outset of this lecture, ought to be taken seriously, not least by those looking for a starting point towards further progress in monetary economics.

Footnotes

¹This does not mean that advocates of the buffer stock approach regard the explanation of the evolution of monetary exchange as either uninteresting or impossible, but they do not regard it as central to the issues which particularly concern them. The reader is referred to Jones (1976) and Niehans (1978) Chapter 6, for analyses of this matter. It might be noted that, in his (1971) textbook Chapter 2, Douglas Fisher made some play with the notion that a monetary system is a substitute for, rather than a complement to, the institution of a market. In stressing money's role as a means of exchange, the buffer stock approach has much in common with Hicks' (e.g., 1982) Chapter 19, analysis of money as a "running asset". This stands in contrast to Tobin's (e.g., 1969) stress on money as a store of value.

²The inventory theoretic approach to the demand for money, as epitomised in the work of Baumol (1952) and Tobin (1956), has the individual's cash holdings fluctuating about an average value in a completely certain environment. Much of the basic analysis of the demand for money in a stochastic framework is surveyed by Orr (1970), where once again the concept of the "demand for money" is explicitly an average over time or target quantity. The models to which I am referring here all deal with individual experiments, and their extension to the market experiment is far from a trivial business. Clower and Howitt (1978) deals with the market experiments which might arise from the Baumol-Tobin style of analysis and in this sense represents a pioneering contribution to the buffer-stock approach upon which others might build.

³The notion that money holding is a substitute for devoting resources to the generation of information is developed at some length in Laidler (1975) Chapter 1. It is also discussed by Brunner and Meltzer (1971).

⁴This line of reasoning of course goes back to Patinkin (1956) and Archibald and Lipsey (1958). Its relationship to the buffer stock approach is developed by Jonson (1976a) and Laidler (1982) Chapter 2. Note that Carr and Darby (1981) represents a recent attempt to incorporate ideas such as this into an empirical study of the aggregate demand for money function.

⁵In the context of the macroeconomics of the open economy, the buffer stock approach is a natural complement to the monetary approach to balance of payments and exchange rate analysis. There is not space to take up these issues in this lecture. See however Jonson and Kierzkowski (1975) and note that this and several other important papers dealing with the buffer stock approach, for example Jonson (1976b), Knight and Wymer (1975), were written as contributions to the SSRC-Ford Foundation London-Geneva Research Programme on International Monetary Economics supervised by Harry Johnson and Alexander Swoboda.

⁶To put matters in terms of the well-known analysis of Archibald and Lipsey (1958) to which Jonson (1976a) and Jonson and Kierzkowski (1975) pay particular attention, so long as the tastes of all agents vis-à-vis goods and money are identical, the aggregate demand for goods and money at any moment will be independent of the distribution of the money stock. Thus every agent can be "off" his long-run demand for money function without there being any macroeconomic consequences, provided that the price level is such as to generate the appropriate aggregate quantity of real balances.

⁷The papers of Akerlof (1973) and Tucker (1971) represent early attempts to come to grips with the analytic implications of this possibility in the context of macro general equilibrium models. I discussed related issues in Laidler (1982) Chapters 2 and 3, but when writing those chapters, I was unaware of the relevance of these earlier papers to my own work. Since I had read both papers at their time of publication, I owe their authors an apology for failing consciously to recall and acknowledge them before now.

⁸We are here dealing with the first round impact of a change in the money supply. The particular combination in which the foregoing variables will change in a neo-Austrian model will depend upon the extent to which the effects on the price level of the initially unexpected change in the money supply are misread by individual agents as reflecting changes in the relative prices of the particular goods and services which they sell. On this see Lucas (1972). I have dealt at length with the role of expectations in the transmission mechanism in Laidler (1982) Chapters 3 and 4. I neglect this issue here, not because it is unimportant, but because it is not central to the matters I am dealing with and because space does not permit me to discuss it to any useful extent.

⁹In particular this is a characteristic of the approach of Tobin and his many associates and followers. See, e.g., Tobin (1969). Note that Tsiang (1982), whose work is highly relevant to the buffer stock approach, has criticised Tobin in particular for insisting on maintaining asset market equilibrium at all points in his analysis of the transmission mechanism.

¹⁰The sequence of events which I have just described is in effect what Chick (1973) aptly termed the "pseudo dynamics of IS-LM".

¹¹ This line of reasoning has been a continuous and important theme in the work of Tsiang. See, for example, (1956 and 1981).

¹² The argument here is at first sight similar to that of Artis and Lewis (1976) but it is, in fact, crucially different from theirs. They made the rate of change of the rate of interest vary with the excess supply of money, while here I am arguing that it is the level of the interest rate relative to some underlying long-run equilibrium value which depends on the excess supply of money. Artis and Lewis achieved promising empirical results with U.K. data, but subsequent work by Laidler (1980) suggests that their formulation does not fit United States data. I am inclined to think that this lack of robustness on the part of the Artis and Lewis formulation reflects the fact that it misspecifies the relationship between excess money holdings and the interest rate.

¹³ Among the articles which helped establish this conclusion are Johnson (1969), Marty (1969) and Patinkin (1969).

¹⁴ It might be noted that in this lecture I am using the phrase "real balance effect" in the rather broader sense adopted by Patinkin in (1967). In Money Interest and Prices (1956) he used the term only to refer to the wealth effects of increases in the supply of fiat money. The question of whether the authorities can in fact vary the quantity of money in a "vertical LM curve" economy is addressed below.

¹⁵ A fixed exchange rate open economy can of course do just that. Even here though the relevant costs have to do with balance of payments functions, and not those associated with individual portfolio adjustments.

¹⁶The argument here is exactly parallel to that set out in Laidler (1982) Chapter 2 which shows that in the presence of price level flexibility, a short-run demand for money function would not be observed. Lane (1983) pp. 112 et seq develops a more general version of this argument. Note that White (1981) argues that in the case of an economy with a well developed financial system, the rate of interest will in fact always move quickly to eliminate a discrepancy between the supply and demand for money, and that therefore, there can be no "disequilibrium" money holdings. White does not, however, go on to show how lagged dependent variables in empirical demand for money functions can be reconciled with this conclusion.

¹⁷Note that I here say "hard" and not "impossible" to justify. If one tries hard enough one can probably reconcile any observation with the postulate that the demand and supply of money are maintained in constant equilibrium. Cf. Laidler (1982) pp. 51-2 and 96-101 for a more detailed discussion of this and related issues.

¹⁸Of course this is not to deny a role to institutional change in shifting the long-run demand for money function in the 1970s. The question is not whether some of our problems arise from this source, but whether all of them do. For a thorough discussion of these issues particularly as they arise in the context of recent United States experience, see Judd and Scadding (1982a).

¹⁹This argument appears to have its roots in a certain passage of the General Theory. See Keynes (1936) p. 197. It was advanced as long ago as (1965) by Gramley and Chase, but has not been too popular, at

least in an explicit form, in the North American literature since then. However, it frequently turns up in British Keynesian writings: see for example Hahn (1971). Kaldor (1980) and Hicks (1982) pp. 262-264.

The counter-argument which I sketch out here has been developed at greater length by Howitt and Laidler (1979), Judd and Scadding (1982a) and Artis and Lewis (1981) among others.

²⁰ Indeed it is hard to see how one can avoid according inventory fluctuations a central role in further analyses of the buffer stock approach. If, when there is an excess supply of money, expenditure in the economy exceeds the level it would otherwise attain by an additional flow driven by a real balance effect, elementary national income accounting tells us that this expenditure will either not be satisfied at all or must be satisfied by running down inventories.

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